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Nota di contenuto	Preface; Contents; 1 Introduction; 1.1 Supergravity and Superstring; 1.2 Gravitational Field; 1.2.1 Metric Formulation; 1.2.2 Vielbein Formulation; 1.3 Yang--Mills Field; 1.4 Antisymmetric Tensor Field; 1.4.1 Dual Field; 1.4.2 Self-dual Field; 1.4.3 Massive Chern--Simons Type Theory; References; 2 Supergravities in Four Dimensions; 2.1 Superalgebras and Supermultiplets; 2.2 Supersymmetric Field Theories; 2.3 $\mathcal{N}=1$ Poincare Supergravity; 2.4 Local Supersymmetry of $\mathcal{N}=1$ Poincare Supergravity; 2.4.1 Invariance of the Action; 2.4.2 Commutator Algebra 2.5 $\mathcal{N}=1$ Anti de Sitter Supergravity 2.6 Extended Supersymmetries; 2.7 $\mathcal{N}=2$ Poincare Supergravity; 2.8 $\mathcal{N}=2$ Anti de Sitter Supergravity; 2.9 $\mathcal{N}=3$ Supergravities; References; 3 Superalgebras and Supermultiplets; 3.1 Spinors in General Dimensions; 3.1.1 Gamma Matrices; 3.1.2 Dirac Spinors; 3.1.3 Weyl Spinors; 3.1.4 Majorana Spinors; 3.1.5 Majorana--Weyl Spinors;

3.1.6 Symplectic Majorana Spinors; 3.2 Super Poincare Algebras; 3.3 Supermultiplets; 3.4 Massless Sectors of M Theory and Superstring Theory; 3.5 Super Anti de Sitter Algebras; References

4 Global Non-compact Symmetries 4.1 Non-linear Sigma Models; 4.1.1  $SL(2, \mathbb{R})/SO(2)$  Non-linear Sigma Model; 4.2 Duality Symmetry; 4.2.1 Duality Symmetry in General Even Dimensions; 4.2.2 Compact Duality Symmetry; 4.2.3 Non-compact Duality Symmetry; 4.3  $D=4, \mathcal{N}=8$  Poincare Supergravity; References; 5 Poincare Supergravities in Higher Dimensions; 5.1 General Structure of Poincare Supergravities; 5.2  $D=11, \mathcal{N}=1$  Poincare Supergravity; 5.3  $D=10, \mathcal{N}=(1,1)$  Poincare Supergravity; 5.4  $D=10, \mathcal{N}=(2,0)$  Poincare Supergravity; 5.5  $D=10, \mathcal{N}=(1,0)$  Poincare Supergravity

References 6 Dimensional Reductions; 6.1 Compactifications and Dimensional Reductions; 6.2 Dimensional Reductions of Field Theories; 6.2.1 Gravitational Field; 6.2.2 Yang-Mills Field; 6.2.3 Antisymmetric Tensor Field; 6.3 Dimensional Reductions of  $D=11, \mathcal{N}=1$  Supergravity; 6.3.1  $D=10$  Theory; 6.3.2  $D=9$  Theory; 6.3.3  $D=8$  Theory; 6.3.4  $D=7$  Theory; 6.3.5  $D=6$  Theory; 6.3.6  $D=5$  Theory; 6.3.7  $D=4$  Theory; 6.4 Dimensional Reductions of  $D=10, \mathcal{N}=(2,0)$  Supergravity; 6.5 Dimensional Reductions of  $D=10, \mathcal{N}=(1,0)$  Supergravity; References; 7 Gauged Supergravities

7.1 Gauged Supergravities and Massive Supergravities 7.2  $D=4, \mathcal{N}=8$  Gauged Supergravity; 7.3 Gauged Supergravities in Higher Dimensions; 7.3.1  $D=7, \mathcal{N}=4$  Gauged Supergravity; 7.3.2  $D=5, \mathcal{N}=8$  Gauged Supergravity; 7.4  $D=10, \mathcal{N}=(1,1)$  Massive Supergravity; References; Appendix A Notation and Conventions; Appendix B Formulae of Gamma Matrices; Index

## Sommario/riassunto

This book is a pedagogical introduction to supergravity, a gravitational field theory that includes supersymmetry (symmetry between bosons and fermions) and is a generalization of Einstein's general relativity. Supergravity provides a low-energy effective theory of superstring theory, which has attracted much attention as a candidate for the unified theory of fundamental particles, and it is a useful tool for studying non-perturbative properties of superstring theory such as D-branes and string duality. This work considers classical supergravities in four and higher spacetime dimensions with their applications to superstring theory in mind. More concretely, it discusses classical Lagrangians (or field equations) and symmetry properties of supergravities. Besides local symmetries, supergravities often have global non-compact symmetries, which play a crucial role in their applications to superstring theory. One of the main features of this book is its detailed discussion of these non-compact symmetries. The aim of the book is twofold. One is to explain the basic ideas of supergravity to those who are not familiar with it. Toward that end, the discussions are made both pedagogical and concrete by stating equations explicitly. The other is to collect relevant formulae in one place so as to be useful for applications to string theory. The subjects discussed in this book include the vielbein formulation of gravity, supergravities in four dimensions, possible types of spinors in various dimensions, superalgebras and supermultiplets, non-linear sigma models for non-compact Lie groups, electric-magnetic duality symmetries, supergravities in higher dimensions, dimensional reductions, and gauged and massive supergravities.